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ABSTRACT

A literature survey established that a substantial amount of research has been conducted on the relationship between productivity and the following specific high performance work practices: employee involvement in decision making, compensation linked to firm or worker performance, and training. According to these studies, high performance work practices are most effective when implemented together as a system. Positive associations between high performance work practices and firms' long-term financial performance and between high performance work practices and higher wages and benefits paid to workers were documented in several studies, including a survey of 700 firms. Although interest in using new workplace practices appeared to be widespread, some firms and workers were still reluctant to adopt such practices. Most of that reluctance was found to stem from a lack of understanding of or information about high performance work systems. Further research about new workplace practices was called for. (An appendix contains summaries of 18 selected research projects dealing with high performance work practices and firm performance. Each summary includes the following: bibliographic citation, sample size/composition, type of data collected/analyzed, results, and comments.) (MN)

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High Performance Work Practices and Firm Performance

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High Performance Work Practices

and Firm Performance

U.S. Department of Labor

August 1993

EXECUTIVE SUMMARY

This document surveys the research on the effectiveness of "high performance work practices." These practices are designed to provide employees with skills, incentives, information, and decision-making responsibility that improve business performance and facilitate innovation.

The evidence indicates that high performance practices are usually associated with increases in firm productivity. These productivity effects are most pronounced when such work practices are implemented together as a system. The research also suggests that high performance work practices are positively associated with a firm's long-term financial performance.

A substantial amount of research has been conducted on the relationship between productivity and three specific high performance work practices--employee involvement in decision-making, compensation linked to firm or worker performance, and training.

- Study results for employee involvement in decision-making have been generally affirmative. A review of 29 studies found that employee participation was associated with positive effects on productivity in 14 studies and negative effects in only 2 studies--while the remaining 13 studies had ambiguous results.

- The relationship between productivity and compensation linked to performance has been consistently positive. A review of 27 studies found that the use of profit sharing was generally associated with 3.5% to 5% higher productivity in firms.

- The more limited evidence on firm training programs also suggests positive productivity effects. For example, one study found that firms that introduced formal training programs after 1983 experienced a 19% larger rise in productivity by 1986 on average than firms which did not introduce a training program.

Some of the most convincing research on new workplace practices focuses on particular industries. Differences in productivity between firms in the same industry are especially illustrative because production technology and products are similar. Studies of the steel and automobile industries examined the productivity effects of work practices when they were implemented together as a system.

- A detailed study of the steel industry found that finishing lines were much more productive when there was a work system including problem-solving teams, gain sharing, training, and employment security. Finishing lines using these innovative work systems ran as scheduled 98% of the time; lines that used virtually no innovations ran as scheduled only 88% of the time.

- In an MIT study comparing automobile plants with similar technology, plants that used innovative work systems (including extensive training, contingent compensation, work teams, problem solving groups, and decentralization of responsibilities for quality control to line workers) manufactured vehicles in an average of 22 hours with 0.5 defects per vehicle. In contrast, more traditional plants took 30 hours with 0.8 defects per vehicle.

Increases in productivity can translate into higher wages and benefits paid to workers and increased profitability for firms. Some studies have directly examined the relationship between work practices and long-term financial performance.

- A survey of 700 firms from all major industries found that companies utilizing a greater number of innovative human resource practices had higher annual shareholder return from 1986-91 and higher gross return on capital. For example, the top 25% of firms--those using the greatest number of "best practices"--had an 11% rate of return on capital, more than twice as high as the remaining companies.

- A study focusing on the *Forbes 500* found that firms with more progressive management style, organizational structure, and reward systems had higher rates of growth in profits, sales, and earnings per share over the five-year period from 1978-83.

- A detailed study of over 6,000 work groups in 34 firms concluded that an emphasis on workplace cooperation and the involvement of employees in decision-making were both positively correlated with future profitability.

Companies recognized for innovative practices also appear to have strong financial performance. Firms selected as among *The 100 Best Companies To Work For In America*--on the basis of factors such as their open and friendly atmosphere, the benefits they provide, and the degree of job security extended--had higher total return (stock price appreciation plus dividends) than the market average over the past eight years. Similarly, the profitability of Baldrige Award finalists rose after they adopted practices emphasizing quality and employee involvement.

Further research is needed, but existing evidence suggests that innovative work practices are positively related to both productivity and firm performance. The adoption of such practices could prove crucial to the future competitiveness of the United States economy.

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I. INTRODUCTION

The strength of the U.S. economy is increasingly dependent upon its success in markets in which firms emphasize quality and are able to adapt rapidly to changing conditions. To accomplish these goals, in turn, firms must increasingly rely upon the creativity, ingenuity, and problem-solving ability of their workers. This survey examines approaches to organizing the workplace that attempt to develop and utilize just these qualities. "High performance work organizations" provide workers with the information, skills, incentives and responsibility to make decisions essential for innovation, quality improvement, and rapid response to change. Systems of mutually reinforcing practices create multiple ways to develop worker skills, to align individual and organizational goals, and to share information crucial to solving problems.

Many firms have implemented at least some high performance work practices. In a nationally representative sample of seven hundred private sector establishments, 37% had a majority of front-line workers engaged in two or more high performance work practices.[1] Firms themselves largely look upon high performance practices as having been successful.[2]

- Of several hundred firms of all sizes that have introduced one or more high performance practices, 70% reported that they had a positive impact on firm productivity.[3]

- Among *Fortune 1000* companies using at least one practice that increased the responsibility of employees in the business process, 60% reported that these practices increased productivity and 70% reported that they improved quality.[4]

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[1] Osterman, Paul. "How Common is Workplace Transformation and Can We Explain Who Adopts It?" *Industrial and Labor Relations Review*, forthcoming. The survey had a response rate of 66% and was limited to establishments with 50 or more employees (which employ over half of all workers). An establishment may be a headquarters or a division of a company. Practices examined were teams, job rotation, Total Quality Management, and Quality Circles.

[2] These data were often reported by executives who made the decisions to implement these work practices.

[3] Bassi, Laurie. *Getting to Work.* Mimeograph, Georgetown University. February, 1993. Surveys were conducted separately for manufacturing (762 respondents, 18% response rate) and non-manufacturing firms (465 respondents, 8% response rate). Work practices include: training, profit sharing, work teams, Total Quality Management, increased responsibility for workers, and reduction of management layers. Estimates from a follow-up survey in this study (714 respondents, 66% response rate) indicated that half of manufacturing and a third of non-manufacturing firms have implemented one or more of these work practices.

[4] Lawler, Edward and others. *Employee Involvement and Total Quality Management.* S.F.: Jossey-Bass, 1992. This survey had a 31% response rate. Employee involvement consisted of survey feedback, job enrichment or redesign, Quality Circles or other participation groups, Quality of Work Life committees, mini-enterprise units, or self-managing work teams.

Unfortunately, many company initiatives are not systemic. The existing evidence suggests that it is the use of comprehensive systems of work practices in firms that is most closely associated with higher productivity and stronger financial performance.

This review of high performance work practices consists of two basic parts. First, it examines the effects on labor productivity of three specific practices--training, compensation linked to firm or worker performance, and employee involvement in decision-making--and of high performance systems in which such practices are implemented together. Second, it examines the relationship between various work practices and financial performance.

This review is limited to certain human resource practices.[5] Some human resource practices are not addressed due to the paucity of existing research; accordingly, the effects of family-oriented work practices, the provision of healthy and safe workplaces, and greater emphasis on employment security are not examined here. A discussion of the important role of technology in promoting high performance workplaces also lies beyond the scope of this review.

While further research on the effects of high performance work practices is needed, an array of surveys and systematic studies has already been conducted. In each of the three specific work practices examined, the evidence suggests a positive relationship between their usage and productivity, and these positive effects appear to be mutually reinforcing. The impact on productivity of systems of inter-related practices appears to be greater than the sum of independent impacts when each component is implemented in isolation. A positive relationship also seems to exist between financial performance of firms and the use of high performance work practices.

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[5] The studies reviewed here report correlations between work practices and firm performance. (The results are therefore suggestive, but do not prove causality.) Some studies compare firms that already use high performance work practices and those that do not. Other studies examine changes in firm performance after introduction of new practices in comparison to firms that do not implement new practices. Some studies attempt to account for factors other than work practices which may account for differences in firm performance, while others do not. Note that studies included in other review articles cited herein were not summarized individually to avoid "double-counting."

II. HIGH PERFORMANCE WORK AND PRODUCTIVITY

Productivity--the amount of output per worker--is a major determinant of the nation's standard of living; increased productivity can lead to both higher wages for workers and higher profits for companies.[6] Thus, the economy's disappointing productivity growth over the past two decades has generated substantial concern.

To help reverse this trend, technological innovations and capital formation will be important, but direct improvements in the productivity of labor are central. Practices that improve the productivity of workers will have significant impacts on overall productivity and economic welfare. This section examines the relationship between the use of innovative work practices and quantitative measures of productivity.[7]

Training

Skill training is a workplace practice that is essential to our nation's future economic prosperity. Companies faced with rapidly changing market conditions rely on workers to anticipate possible problems, eliminate bottlenecks, avoid production shut-downs, develop new products and ensure quality. These firms also utilize group meetings where workers need strong social and communications skills to contribute effectively and implement improvements. Emphasis on quality and prevention of mistakes requires that employees have a broader understanding of the production process and of the information technology used to monitor it. In short, the production process used by these firms underscores the importance of training that provides general problem-solving skills.

One study examined formal training programs in 155 manufacturing firms. Those that introduced a formal training program for some employees after 1983 experienced a 19% larger rise in productivity by 1986 on average than firms that did not introduce a training program. Businesses that were operating below their expected labor productivity levels in 1983 were more likely to adopt new employee training programs between 1983 and 1986. The use of formal training programs was associated with significantly larger increases in productivity growth, bringing these businesses up to the labor productivity levels of comparable businesses by 1986.[8]

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[6] Increased productivity due to new work practices will lead to higher profitability if the productivity benefits are greater than the costs to a firm of implementing these new practices.

[7] Productivity and related quality measures can be assessed at the plant or work group level, which allows detailed analysis of effects from changes in work practices.

[8] Bartel, Ann. "Productivity Gains from the Implementation of Employee Training Programs." *Industrial Relations*, forthcoming.

Training is also associated with improved quality of output. In a survey of 157 small manufacturing firms in Michigan (500 or fewer employees), researchers found that increased formal training significantly reduced the rates at which products had to be scrapped. Their results suggest, for instance, that doubling the training per employee from the initial average of 15 hours would result in a 7% reduction in scrap.[9]

Compensation Policy

Linking compensation and performance more directly can create incentives for workers to pursue the interests of the team and the organization. These incentives may increase worker effort and align workers more closely with the long-term interests of the firm--resulting in better communication, increased product quality, longer job tenure, and greater acceptance of technological change.

An exhaustive survey of the effects of profit sharing on productivity reviewed 27 econometric studies. Almost all (91%) of the statistical tests in the econometric studies found that profit sharing was positively correlated with productivity. The positive correlation between the use of profit sharing and firm productivity held both when comparing profit sharing and non-profit sharing firms and when comparing productivity in a particular firm before and after it adopted profit sharing. Productivity was generally 3% to 5% higher in firms with profit sharing plans than in those without plans. Firms implementing profit sharing showed similar productivity gains after adoption.[10]

Gain sharing is another type of compensation system, where pay corresponds more directly to worker performance than under conventional approaches. IMPROSHARE is a type of gain sharing in which workers are essentially paid bonuses equal to one-half of any increase in productivity. A study of IMPROSHARE's use in manufacturing firms found that defect and downtime rates fell by 23% each in the first year after the approach was introduced. In the median firm, the overall increase in productivity was more than 5% in the first three months, and more than 15% by the third year. In comparison, productivity increased by an average of roughly 2% per year in these manufacturing sectors.[11]

The presence of either profit sharing or gain sharing was found to be associated with

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[9] Holzer, Harry *et al.* "Are Training Subsidies for Firms Effective? The Michigan Experience." *Industrial and Labor Relations Review.* forthcoming.

[10] Kruse, Douglas. *Profit Sharing: Does It Make a Difference?* Kalamazoo: Upjohn Institute, forthcoming. Of the 27 studies, 9 examine U.S. firms.

[11] Kaufman, Roger T. "The Effects of IMPROSHARE on Productivity." *Industrial and Labor Relations Review* 45:2. January 1992. pp. 311-322.

higher productivity in an analysis of over 800 manufacturing establishments in five Michigan counties.[12] These group-based pay schemes were more prevalent in firms that also pay higher wages. Yet for both union and non-union firms, the level of value-added associated with the use of profit sharing or gain sharing exceeded the difference in wages, so the net value-added was positive.[13]

Work Organization and Employee Involvement in Decisions

Organizing work to involve front-line workers in decisions can occur through participation in teams and through decentralization of responsibility. Within teams, job rotation and cross-training can reduce fatigue, help produce greater job satisfaction, and reduce absenteeism and turnover problems. Peer pressure can also push workers to be more productive. Decentralization can result in better decisions by involving more people who have direct understanding of the issues at hand and by eliciting higher commitment from participants.

A comprehensive survey of the existing research on the effects of workplace participation on productivity suggests that the effects are positive. Of the 29 studies reviewed, 14 indicated that workplace participation has a positive effect on productivity, only 2 indicated negative effects, and in the remainder the effects were inconclusive.[14] While measuring employee participation is inherently difficult, this consistency in results across studies of widely varying samples and methodologies gives credibility to these findings.[15] The reviewers concluded that introducing participation was more likely to produce a significant, long-lasting increase in productivity when it involved decisions that extended to the shop floor and when it involved substantive participation in decision-making by front-line workers. In contrast, consultative arrangements such as quality circles--which involve information sharing rather than decision-making--often had short-lived benefits. A wealth of ideas built up over time can be brought forth this way, but enthusiasm for these arrangements

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[12] Cooke, William. "Employee Participation, Group-based Pay Incentives, and Company Performance: A Union-Nonunion Comparison." mimeograph, Wayne State University, 1993.

[13] In non-union firms using profit sharing or gain sharing, the use of work teams was correlated with modest increases in productivity. In unionized firms using profit or gain sharing, the use of work teams appeared to have no effect on productivity. The use of teams alone was associated with much higher net value-added in unionized firms, and slightly lower value-added in non-union firms.

[14] Levine, David I. and Laura D'Andrea Tyson. "Participation, Productivity, and the Firm's Environment." in *Paying for Productivity*, ed. by Alan Blinder. Washington: The Brookings Institution, 1990. pp. 183-235.

[15] The studies reviewed include case studies, field experiments, and econometric tests. The participation measures included, for example, the existence of quality circles, work teams, works councils, as well as the number of workers participating in such groups.

waned without worker participation in decisions.

An analysis of field studies at individual companies undertaken between 1961 and 1991 examined the relationship between productivity and 44 work practices in three main categories: structural (e.g., job design, teamwork), human resources (training, communication), and technological (computerization, robotics). Differences in average performance between experimental/control groups and pre/post evaluations of changes were analyzed for productivity, quality, and cost performance measures that were standardized across the field studies. Results based on 75 studies showed that changes in work practices were strongly related to increased productivity. In a selected sample of the field studies, the introduction of new practices was generally associated with a 30% to 40% improvement in performance.[16]

The effects of work organization on productivity from the use of machine tools has been studied extensively. An examination of computer controlled technology in over 1,000 firms found that production time decreased considerably when shopfloor workers wrote their own control programs; in other words, decentralization of work responsibilities was correlated with increased productivity. The results of this study suggested that if the percentage of workers who wrote their own programs increased from the existing level of 45% to a level of 75%, then total production time would decrease about 9%.[17]

In other research using the same data, the presence of collaborative problem-solving committees in unionized plants was found to have an ambiguous association with productivity in machining. In non-union plants, problem-solving committees appear to be associated with lower productivity than in plants without committees.[18]

Systems of High Performance Work: Industry Studies

Another source of information on the effects of work organization on productivity is the study of industries. This approach allows for an assessment of firms which have the same available technology and produce essentially similar products, but which differ in work

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[16] Macy, Barry and Hiroaki Izumi. "Organizational Change, Design, and Work Innovation: A Meta-analysis of 131 North American Field Studies--1961-1991." in *Research in Organizational Change and Development*. ed. by R. Woodman and W. Pasmore. JAI Press, forthcoming.

[17] Kelley, Maryellen. "Productivity and Information Technology." working paper 92-2, School of Urban and Public Affairs, Carnegie-Mellon University. January, 1992.

[18] Kelley, Maryellen and Bennett Harrison. "Unions, Technology, and Labor-Management Cooperation." in *Unions and Economic Competitiveness*, ed. by Lawrence Mishel and Paula Voos. Washington: Economic Policy Institute, 1992.

practices. The implementation of systems of high performance work has been most thoroughly studied in the steel, automobile, and components manufacturing industries.

Steel. A rich combination of workplace practice and productivity data has been collected in the steel industry. Concentrating on a single industry with a fairly homogeneous product (steel), analysts examined productivity by tracking monthly "uptime" in 30 comparable finishing lines in the U.S, where uptime is the fraction of time the line is running as scheduled.[19] These analysts then examined the effects of a wide range of work practices on productivity differences between lines, and on differences after the introduction of a new practice on a given line.[20]

The authors used statistical techniques to identify four distinct human resource management systems. For example, production lines that adopted "System 1" utilized much more innovative practices than "System 4" lines (as shown in the following table), while Systems 2 and 3 were gradations of these extremes.

Work Practices	System 1	System 4
Problem-solving skills training	Common	Uncommon
Worker-management discussions	Frequent	Infrequent
Problem-solving teams used	Often	Seldom
Job classifications	Few	Many
Gain sharing compensation	Used	Not used
Selection procedures	Extensive	Minimal
Employment security	High	Low

The presence of more innovative systems was associated with significantly higher productivity; the difference in uptime between System 1 lines (those most characterized by high performance work practices) and System 4 lines (those least characterized by high performance work practices) was especially large. The following table shows estimates of uptime for otherwise comparable lines that used different systems of work practices:

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[19] Uptime is used as a measure of productivity because steelworkers influence output levels mainly through prevention of delays. Other key production parameters (such as width and gauge of steel, and the line speed) are determined by the technical specifications of the line and the specification of customer orders.

[20] Ichniowski, Casey, Kathryn Shaw, and Giovanna Prennushi. "Effects of Human Resource Management Practices on Productivity." mimeograph, Columbia University, June 10, 1993.

	System 1	System 2	System 3	System 4
Uptime	98%	92%	90%	88%

Among lines where changes in work practices have occurred, the movement towards high performance systems also seemed to raise productivity. At the same time, however, the introduction of any single practice without a change in the set of practices that define the overall system had no effect on productivity.

Consistent with the results reviewed above on training, incentive pay, and work organization, this study found small positive productivity effects when comparing lines with and without specific policies. The magnitude of the effect from any specific work practice, however, largely depended upon the presence of a systemic approach. Individual practices had little or no effect unless they were part of a larger set of complementary work practices.

Automobiles. In the automobile industry, plants with better product quality and higher productivity utilize flexible production systems--relying heavily on multi-skilled employees who are actively involved in quality control and problem solving. MIT's International Motor Vehicle Program collected data on labor productivity, quality, and type of production organization from 62 plants representing 24 producers in 16 countries. Researchers used statistical techniques to differentiate traditional "mass production" plants from "flexible production" plants, which are characterized in the following table:[21]

Work Practice[22]	Mass Production	Flexible Production
Employee training	Minimal	Extensive
Contingent compensation	Uncommon	Common
Use of work teams	None	Extensive
Use of problem solving groups	Minimal	Extensive
Suggestions made and implemented	Few	Many
Job rotation	None	Frequent
Decentralization of quality control	Minimal	Extensive
Selection criteria	Job history	Interpersonal skills/ willingness to learn

[21] MacDuffie, John Paul and John Krafcik. "Integrating Technology and Human Resources for High-Performance Manufacturing." in *Transforming Organizations*, ed. by Thomas Kochan and Michael Useem. New York: Oxford University Press, 1992. pp. 210-226.

[22] These work practices were also highly correlated with the use of buffers of inventory and repair space, with mass production systems and flexible production plants having minimal buffers (e.g. a Just-In-Time inventory systems) to make problems visible and promote problem solving.

The performance of mass production plants was then compared to that of flexible production plants using roughly the same level of technology. For vehicles with comparable complexity, High Technology/Mass Production plants took 30 hours for assembly and had 0.8 defects per vehicle. Both production time and defect rates were substantially lower for High Technology/Flexible Production plants, which took 22 hours to assemble a vehicle with an average of 0.5 defects. The various work practices evaluated here appeared to have the greatest impact when bundled together into systems that were integrated with the overall production strategy.

Components-Manufacturing. A detailed study of a components-manufacturing operation analyzed the impact of industrial relations on productivity and quality in 25 work areas which performed fabrication, assembly, storage, and general services within a single plant.[23] The categorization of industrial relations within work groups ranged from traditional to non-traditional, which were defined as follows:

Measures of Industrial Relations	Traditional	Non-traditional
Frequency of conflict	High	Low
Speed of conflict resolution	Slow	Quick
Number of problem solving efforts initiated	Few	Many
Level of worker autonomy	Minimal	Substantial
Frequency of feedback	Seldom	Frequent
Frequency of worker-initiated changes in work design	Rare	Common

The performance differences between work areas with non-traditional versus traditional relations were substantial. On average, non-traditional relations were associated with 75% less worker hours lost to scrap, 42% fewer defects per worker, and 17% higher labor productivity. Over the three years of the study, a shift towards non-traditional relations within a given work area resulted in significantly lower costs, less time lost to scrap, and higher productivity.

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[23] Cutcher-Gershenfeld, Joel. "The Impact on Economic Performance of a Transformation in Workplace Relations." *Industrial and Labor Relations Review*, January 1991. pp. 241-260. This study observed the primary manufacturing facility of the Xerox Corporation from 1984-87.

III. HIGH PERFORMANCE WORK AND FINANCIAL PERFORMANCE

This section examines the relationship between high performance work practices and financial outcomes. The evidence suggests that there is a positive correlation between high performance work and stronger financial performance. High performance practices again appear to have an especially large impact on financial performance when they are used in concert with each other.

Surveys of Firm Practices

The most comprehensive study of work practices and financial performance is based on a survey of over 700 publicly held firms from all major industries. This study examined the use of "best practices" in the following areas:[24]

Evaluated Areas of "Best Practice" in Human Resources

personnel selection	performance appraisal	incentive systems
job design	promotion systems	grievance procedures
information sharing	attitude assessment	labor-management participation

Based an index of "best practice" prevalence, firms using more progressive policies in these areas were generally found to have superior financial performance. The 25% of firms scoring highest on the index performed substantially higher on key performance measures, as shown in the following table:

	Quartile of human resource practice index			
Performance measure	Bottom 25%	2nd 25%	3rd 25%	Top 25%
Annual shareholder return[25]	6.5%	6.8%	8.2%	9.4%
Gross return on capital[26]	3.7%	1.5%	4.1%	11.3%

[24] Huselid, Mark. "Human Resource Management Practices and Firm Performance." mimeograph, IMLR, Rutgers University. June 15, 1993.

[25] Annual change from 1986-91 of share price plus dividends.

[26] Gross cash flow / gross capital stock in 1991.

The top 25% of firms--those using the most "best practices"--had an annual shareholder return of 9.4% versus 6.5% for the firms in the bottom 25%. Firms in the top 25% had an 11% gross rate of return on capital, more than twice as high as the remaining firms. After accounting for other factors likely to influence financial performance (such as industry characteristics), the human resource index remained significantly related to both performance measures.[27]

An earlier study with a similar methodology examined non-union manufacturing firms using a work system including flexible job design, formal employee training, merit-based promotions, and formal employee management communication mechanisms. The use of such a system was associated with substantially higher stock market value and labor productivity than systems incorporating few or none of these practices.[28]

Another study of human resource practices and economic performance examined 150 of the Forbes 500 firms. Surveys and focus groups were conducted to assess 73 elements of human resource practice, grouped into six main areas: participation and management style, culture, organizational structure, creativity, reward systems, and flexibility and accommodation of needs. Based on these human resource practices, a progressivity index was created. The 75 firms scoring highest on this index were grouped together as "progressive" companies; the 75 firms scoring lowest were considered "less progressive" companies. It turns out that the progressive companies fared considerably better according to several financial indicators, as shown in the following table:[29]

Annual Change in Financial Performance, 1978-83

Measure	75 Progressive	75 Less Progressive
Profit growth	10.8%	2.6%
Sales growth	17.5%	10.7%
Growth in earnings per share	6.2%	-3.9%
Dividend growth	13.4%	9.2%

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[27] This study also found that the human resource index was positively correlated with higher performance on two more technical performance measures: Tobin's *q* (market value / replacement cost of assets), and price-cost margin (gross profits before depreciation / net sales). Using the same sample of firms, the index was also associated with higher sales per worker and lower employee turnover. See Mark Huselid. "The Impact of Human Resource Management Practices on Turnover and Productivity." Mimeograph, IMLR, Rutgers University. June 15, 1993.

[28] Ichniowski, Casey. "Human Resource Management Systems and the Performance of U.S. Manufacturing Businesses." NBER Working Paper No. 3449. September, 1990.

[29] Kravetz, Dennis. *The Human Resources Revolution.* S.F.: Jossey-Bass, 1988.

These results show, for example, that the progressive group of firms experienced a growth in profits of nearly 11 percent a year. This was nearly four times the rate of growth in profits among the less progressive firms. Note also that while the progressive firms experienced a substantial growth in the amount of earnings per share, the less progressive firms experienced a decline in earnings per share.

A detailed study of over six thousand work groups in 34 firms using the Survey of Organizations has also been undertaken, examining several organizational criteria:[30]

Work Practice	Criteria
organization of work	adaptability clarity of goals decision-making at appropriate levels
emphasis on human resources	good working conditions well-being/motivation of employees
decision-making practices	access to information employee participation
coordination	cooperation dispute resolution

The financial performance of these firms was measured at the time of the organizational evaluation and for five subsequent years; these measures were then standardized by industry. A firm's organization of work and emphasis on human resources were found to be closely related to financial performance. Return on investment and return on sales were positively correlated with both practices at the time the presence of these practices were assessed and in each of five subsequent years. Decision-making practices and coordination were not related to current performance but were positively correlated with performance three to five years after the assessment.[31]

Another study also used the Survey of Organizations to examine the importance of organizational factors in predicting profitability. As an organizational indicator, analysts used "emphasis on human resources" (measuring employee perception of the organization's concern with welfare, work conditions, etc.). Data for 60 companies were examined, with

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[30] The Survey of Organizations was commissioned by over 200 firms between 1966 and 1981. Thousands of individual respondents recorded their job and organizational characteristics, and their impression of the effectiveness of these characteristics. Financial performance data was only available for some of these firms.

[31] Denison, Daniel. *Corporate Culture and Organizational Effectiveness.* New York: John Wiley & Sons, 1990.

adjustments made for other factors that may influence a firm's profitability, such as differences in profitability by industry. The study found that an emphasis on human resources was strongly associated with higher profitability as measured by the average return on assets over five years.[32]

Companies Recognized for Innovative Practices

It is common practice for companies to be ranked along various criteria to determine which ones are the "best" or "most innovative." Although these rankings are not based solely on criteria associated with high performance workplace practices, such practices are usually included. Analyses of innovative companies--the "100 Best Companies" and the winners of the Baldrige Award--suggest that these firms are also likely to perform well.

The firms listed among *The 100 Best Companies to Work For in America* in 1993 were selected from nominations solicited by the authors based on pay/benefits, availability of opportunities, job security, pride taken in work/company, level of openness/fairness, and friendliness/camaraderie.[33] Firms chosen based on these characteristics were also likely to be strong economic performers according to a variety of indicators:[34]

- In terms of total shareholder return (the sum of stock price appreciation and dividends paid), the annual return for the 1993 *100 Best* was 19.5% over the previous eight years compared to a 12% annual return for the 3,000 largest companies in America.

- The financial performance of firms after they have been chosen as one of the *100 Best* is also illuminating. Firms among *The 100 Best Companies to Work For in America* in 1984 had an annual total return of 15% in the eight subsequent years, also above the average of 12% for the 3,000 largest companies.[35]

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[32] Hansen, Gary S. and Birger Wernerfelt. "Determinants of Firm Performance: Relative Importance of Economic and Organizational Factors." *Strategic Journal of Management.* vol. 10, 1989. pp. 399-411.

[33] Levering, Robert and Milton Moskowitz. *The 100 Best Companies to Work for in America.* New York: Doubleday, 1993.

[34] Because the *100 Best Companies* are not a random sample of all companies having the identifying work practices.

[35] Annual return data on publicly traded companies in the 1993 *100 Best* (63 firms), the 1984 *100 Best* (62 firms) and the Frank Russell 3,000--the 3,000 largest companies in America (with each firm weighed equally, not by capital) was provided by Oliver Buckley of BARRA.

- About two-thirds of the firms in the 1993 *100 Best* ranked in the top half of their industry in return on sales and in return on assets.[36]

A sample of Baldrige National Quality Award finalists was used to examine the change in financial performance of firms after they implemented comprehensive changes in work practices; altogether, 15 companies considered exemplary in their customer-driven approach to quality, strong leadership, continuous improvement, and employee involvement were analyzed. The adoption of those exemplary practices was associated with better employee relations, improved operating procedures, greater customer satisfaction, and enhanced operating results. The average annual increase in market share after implementing new practices was 13.7%. Operating results, such as return on assets and return on sales, improved for all but two of the reporting companies after the adoption of these practices.[37]

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[36] Dun & Bradstreet Financial Profiles, provided by Tom McClain. Measures of profitability were available for 60 of the 100 firms in 1991. Return on sales is (net profit after taxes)/(net sales). Return on assets is (net profit after taxes)/(total assets).

[37] General Accounting Office. "Management Practices: U.S. Companies Improve Performance Through Quality Efforts." GAO/NSIAD-91-190. 1991. Eleven companies reported data on market share, nine reported return on assets, and eight reported return on sales. The Baldridge finalists are not necessarily representative of all firms that adopted the identifying work practices.

IV. CONCLUSION

There appears to be widespread firm interest in using new workplace practices. The existing evidence suggests there is a positive correlation between high performance work practices and both productivity and long-term financial performance. The evidence shows that specific practices such as training, alternative pay systems, and employee involvement are often associated with higher productivity. Industry studies show that these and other practices can have a larger impact when implemented together in systems. The analysis of financial indicators reinforces the findings that stronger firm performance is associated with systems of high performance work practices.

Still, there is some reluctance by firms and workers to adopt such practices and for investors to include workplace practice information in their company assessments. Some of the reluctance stems from a lack of understanding or information about high performance work systems. Indeed, a recent survey indicates firms are just as interested in literature on the effectiveness of high performance work as they are in financial assistance in implementing new work practices.[38]

The information gap is beginning to be filled. Research about workplace practices is becoming more common and is of increasingly higher quality. This paper is part of a comprehensive Labor Department effort to disseminate information and knowledge about new workplace practices and their effects, and to foster further investigation. Firms will then be in a better position to judge the merits of these practices for themselves.

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[38] Bassi, Laurie J. *Smart Workers, Smart Work: A Survey of Small Businesses on Workplace Education and Reorganization of Work.* Washington: Southport Institute for Policy Analysis, 1992.

APPENDIX. SELECTED RESEARCH SUMMARIES

Bartel (1993).	Training and productivity in 155 manufacturing firms.
Buckley (1993), McClain (1993).	Financial performance of the *100 Best Companies*.
Cooke (1993).	Participation, pay incentives, and productivity in over 800 Michigan manufacturing firms.
Cutcher-Gershenfeld (1991).	Workplace relations and productivity in 25 work groups.
Denison (1990).	Work organization and profitability in 34 firms.
General Accounting Office (1991).	Performance of 15 Baldrige Award finalists.
Hansen and Wernerfelt (1989).	Human resource emphasis and profitability in 60 firms.
Holzer *et. al.* (1993).	Training and output quality in 157 Michigan manufacturing firms.
Huselid (1993).	Human resource practices and profitability in over 700 publicly held companies.
Ichniowski (1990).	Work systems, stock market value and productivity in 65 manufacturing companies.
Ichniowski *et. al.* (1993).	Human resource systems and productivity on 30 steel finishing lines.
Kaufman (1992).	Productivity for 112 gain sharing plans in manufacturing.
Kelley (1992). Kelley and Harrison (1992).	Employee responsibility and participation in 1,000 machining firms.
Kravetz (1988)	Financial performance of 150 large firms with "progressive" human resource systems.
Kruse (1993).	Review of 27 studies on profit sharing and productivity.
Levine and Tyson (1990).	Review of 29 studies on employee participation in decision-making and productivity.
MacDuffie (1993). MacDuffie and Krafcik (1992).	Flexible production, productivity, and quality in 62 auto assembly plants.
Macy and Izumi (1993).	Organizational change and performance in 131 studies.

Training and productivity in 180 manufacturing firms.

Citation

Bartel, Ann. "Productivity Gains from the Implementation of Employee Training Programs." *Industrial Relations*, forthcoming.

Sample

155 Compustat II business lines in the manufacturing sector. Data were from the 1986 Columbia Business Unit survey, which had a survey response rate of 6.5%. The sample does closely match the industrial distribution of all 1986 Compustat II business lines.

Data

Performance: net sales per worker. Controls for the industry average cost of purchased materials are used to approximate the value added.

Work Practices: percentage of occupational groups (among 7 groups) that had formal training, a job design program, a performance appraisal system, and an employee involvement program.

Results

Firms that introduced formal training programs after 1983 experienced a 19% larger rise in productivity by 1986 on average than firms that did not introduce a training program. Businesses that were operating below their expected labor productivity levels in 1983 were more likely to adopt new employee training programs between 1983 and 1986. The use of formal training programs was associated with significantly larger increases in productivity growth, bringing these businesses up to the labor productivity levels of comparable businesses by 1986.

Comments

The introduction of job design, performance appraisal, and employee involvement programs did not have significant effects on productivity growth. The data did not permit an analysis of the long-run effect of the implementation of formal training programs.

Financial Performance of the *100 Best Companies*.

Citation

Buckley, Oliver. Personal communication, BARRA, June 4, 1993.

McClain, Thomas. Personal communication, Dun & Bradstreet, March 12, 1993.

Sample

Publicly held companies from firms listed by authors Robert Levering and Milton Moskowitz in *The 100 Best Companies to Work For in America* (New York: Doubleday) in 1993 and in 1984. Stock market data were available for 63 of the 1993 firms and 62 of the 1984 firms. Accounting data were available for 60 of the 1993 *100 Best*.

Data

Performance: annual rate of total shareholder return from 1985-92 (the sum of stock price appreciation and dividends paid--with each firm weighted equally), return on sales (net profit after taxes / net sales), return on assets (net profit after taxes / total assets).

Work Practices: pay/benefits, availability of opportunities within the firm, job security, pride taken in work/company, level of openness/fairness, and friendliness/camaraderie.

Results

From more than 400 nominations solicited by the authors, finalists were chosen on the basis of written material; the *100 Best* were then selected after on-site visits and employee interviews. The annual rate of total shareholder return is shown in the following table (Buckley, 1993):

1985-92	1993 *100 Best*	1984 *100 Best*	Frank Russell 3,000
Shareholder return	19.5%	15%	12%

67% of the firms in the 1993 *100 Best* ranked in the top half of their industry in return on sales and in return on assets in 1991 (McClain, 1993).

Comments

Because the *100 Best Companies* are not a random sample of all companies having the identifying work practices, the correlation between these practices and firm performance is not clear.

Participation, pay incentives, and productivity in over 800 Michigan manufacturing firms.

Citation

Cooke, William. "Employee Participation, Group-based Pay Incentives, and Company Performance: A Union-Nonunion Comparison." Mimeograph, Wayne State University, July 1993.

Sample

Responses from over 800 manufacturing establishments in five Michigan counties. Effective response rates to various questions ranged from about 25% to 33%.

Data

Performance: value added per employee--controlling for industry-wide factors, level of computer-aided technology, and workforce skill.

Work Practices: presence of teams, profit sharing or gain sharing.

Results

The net impact from combinations of employee participation and group-based incentives was calculated by estimating the effects on value added per employee and subtracting the labor costs associated with that combination. For example, nonunion firms using teams and group-based pay have 26% higher value added than those not using these practices, and they also have 5% higher labor costs. Thus, the net impact on value added minus the cost of labor is 21%. The following table reports these results for various combinations of practices in comparison to nonunion firms not using teams or group-based pay (where value = value-added, LC = labor costs, and diff = difference).

work practice	Union			Non-union		
	value	LC	diff	value	LC	diff.
none	29%	16%	13%	(base for comparison)		
teams only	48%	13%	35%	5%	7%	- 2%
group-based pay	39%	20%	19%	25%	7%	18%
teams and group-based pay	34%	15%	19%	26%	5%	21%

Comments

Teams were associated with a positive net impact on value-added in union firms and negative impact in nonunion firms (unless combined with group-based pay). Group-based pay was associated with a positive net impact in union firms and an even greater positive impact in non-union firms.

Workplace relations and productivity in 25 work groups.

Citation

Cutcher-Gershenfeld, Joel. "The Impact on Economic Performance of a Transformation in Workplace Relations." *Industrial and Labor Relations Review* 44:2. January 1991. pp. 241-260.

Sample

25 work areas in the components-manufacturing operations of a Xerox plant--which performed fabrication, assembly, storage, and general services.

Data

Performance: average labor-hours per task (standardized by task), hours lost to scrap, and number of defects per worker. Data were recorded monthly over three years.

Work Practices: frequency of conflict, speed of conflict resolution, number of problem solving efforts initiated, level of worker autonomy, frequency of feedback, and frequency of worker-initiated changes in work design.

Results

Non-traditional labor-management relations were defined with the following properties: low frequency of conflict, quick conflict resolution, frequent initiation of problem solving efforts, substantial worker autonomy, frequent feedback, and frequent worker-initiated changes in work design. On average, non-traditional relations were associated with 75% less worker hours lost to scrap, 42% fewer defects per worker, and 17% higher labor productivity. Within a given work area, a shift towards non-traditional relations over the three years of the study resulted in significantly lower costs, less time lost to scrap, and higher productivity.

Comments

Cutcher-Gershenfeld noted that Xerox and its workers' union, the Amalgamated Textile and Clothing Workers Union, have had a long tradition of positive relations. Even within this setting, improvement of industrial relations was associated with higher productivity.

Work organization and profitability in 34 firms.

Citation

Denison, Daniel. *Corporate Culture and Organizational Effectiveness.* New York: John Wiley & Sons, 1990.

Sample

34 firms that had a "Survey of Organizations" review of their company, based on responses from 6,671 work groups. The Survey of Organizations was commissioned by over 200 firms between 1966 and 1981; thousands of individual respondents recorded their job and organizational characteristics, and their impression of the effectiveness of these characteristics. 34 of these firms had financial performance data available for analysis.

Data

Performance: return on investment (income after taxes / total investment) and return on sales (income after taxes / net sales), standardized by industry. Performance data were observed in the year of the survey on work organization and for five subsequent years.

Work Practices: organization of work (adaptability, clarity of goals, decision-making at appropriate levels); emphasis on human resources (good working conditions, well-being/motivation of employees); decision-making practices (access to information, participation); coordination (cooperation, dispute resolution).

Results

Return on investment and return on sales were positively correlated with both organization of work and emphasis on human resources at the time these practices were assessed and in each of five subsequent years. Decision-making practices and coordination were not related to current performance but were positively correlated with performance three to five years after the assessment.

Comments

The indicators of work practices for a firm aggregate responses of many individuals, as opposed to relying on one respondent per firm--as in other studies. The Survey of Organizations is not a random sample, but selection bias problems may be somewhat reduced because comparisons are only made within the sample.

Performance of 15 Baldrige Award finalists.

Citation

General Accounting Office. "Management Practices: U.S. Companies Improve Performance Through Quality Efforts." GAO/NSIAD-91-190. 1991.

Sample

15 companies chosen as Baldrige National Quality Award finalists in 1988 or 1989 that reported financial performance data. Eleven companies reported data on market share, nine reported return on assets, and eight reported return on sales.

Data

Performance: annual rate of change in market share, return on assets (earnings before interest and taxes / average gross assets), return on sales (earnings before interest and taxes / net sales).

Work Practices: customer-driven approach to quality, strong quality leadership, continuous improvement, and employee involvement.

Results

Baldrige finalists were chosen on the basis of written applications demonstrating strengths among the identifying work practices. GAO then compared a firm's economic performance before and after the introduction of these work practices. The annual average increase in market share after implementing new practices was 13.7%. The annual average increase in return on assets was 1.3 percentage points. The annual average increase in return on sales was 0.4 percentage points. The small sample size made average changes in performance sensitive to extreme results for individual companies, but each measure of operating results improved for all but two of the reporting companies after the adoption of new practices.

Comments

The adoption of innovative practices was also associated with better employee relations, improved operating procedures, greater customer satisfaction, and enhanced operating results. The Baldrige finalists are not necessarily representative of all firms that adopted the identifying work practices.

Human resource emphasis and profitability in 60 firms.

Citation

Hansen, Gary S. and Birger Wernerfelt. "Determinants of Firm Performance: Relative Importance of Economic and Organizational Factors." *Strategic Journal of Management.* vol. 10, 1989. pp. 399-411.

Sample

60 *Fortune 1000* companies that had a "Survey of Organizations" review of their company. The Survey of Organizations was commissioned by over 200 firms between 1966 and 1981; thousands of individual respondents recorded their job and organizational characteristics, and their impression of the effectiveness of these characteristics. 60 of these firms had financial performance data available for analysis.

Data

Performance: annual rate of return on assets, averaged over a five year interval centered on the year of the work practice survey. Adjusted for industry differences and for inflation.

Work Practices: emphasis on human resources (employee perception of company concern with employee welfare and work conditions).

Results

An emphasis on human resources was strongly associated with higher profitability as measured by the average return on assets over five years.

Comments

The indicator of work practices for a firm aggregates responses of many individuals, as opposed to relying on one respondent per firm--as in other studies. The Survey of Organizations is not a random sample, but selection bias problems may be somewhat reduced because comparisons are only made within the sample.

Training and output quality in 157 Michigan manufacturing firms.

Citation

Holzer, Harry *et al.* "Are Training Subsidies for Firms Effective? The Michigan Experience." *Industrial and Labor Relations Review.* forthcoming.

Sample

157 responses from manufacturing firms in Michigan that applied for a state training grant, had 500 or fewer employees, and were implementing some type of new technology. The response rate to this survey was 32%.

Data

Performance: change in scrap rate from previous year, in 1987 or 1988. Controls included for differences in industrial relations environment and reasons for training.

Work Practices: annual hours of training per employee.

Results

In comparison to the previous year, increased training was associated with decreased scrap rates. For instance, doubling the training per employee from the initial average of 15 hours, for instance, would result in a 7% reduction in scrap.

Comments

Most of the changes in training time were exogenously induced by the award of a state training grant. Firms that received grants were compared to firms that applied for grants after program funding was exhausted. Because grants were provided on a "first-come, first-served" basis, the recipients and non-recipients are otherwise comparable.

Human resource practices and profitability in over 700 publicly held companies.

Citation

Huselid, Mark. "Human Resource Management Practices and Firm Performance." Mimeograph, IMLR, Rutgers University, June 15, 1993.

Sample

Responses from over 700 publicly held firms from all major industries. Excluded from the sample were firms with less than 100 employees, foreign firms, and holding companies. The response rate to this survey was 29%.

Data

Performance: Annual shareholder return 1986-91 (share price plus dividends), gross rate of return on capital (gross cash flow/gross capital stock), Tobin's *q* (market value/replacement cost of assets), price-cost margin (gross profits before depreciation/net sales). Controls for: industry profitability, net sales, and total assets; firm and industry-level union coverage; specific market risk; industry concentration; investment in research and development; and five-year sales growth.

Work Practices: an index of human resource sophistication equivalent to the percentage of practices the average worker is affected by in a firm, based on the within-firm adoption of ten practices: use of employment testing in personnel selection; use of performance appraisals; linking performance appraisals and compensation; access to profit sharing, gain sharing, or other incentive plans; use of formal job analysis; promotions from within for non-entry level jobs; access to complaint resolution system; use of information sharing program; use of attitude surveys; and use of employee participation.

Results

	Quartile of human resource index			
Measure	Bottom 25%	2nd 25%	3rd 25%	Top 25%
Annual shareholder return	6.5%	6.8%	8.2%	9.4%
Gross return on capital	3.7%	1.5%	4.1%	11.3%
Tobin's *q*	0.47	0.46	0.39	0.59
Price-cost margin	0.37	0.39	0.41	0.44

Comments

After including controls for other factors likely to influence financial performance, the human resource index remained significantly correlated with all four performance measures.

Work systems, stock market value, and productivity in 65 manufacturing companies.

Citation

Ichniowski, Casey. "Human Resource Management Systems and the Performance of U.S. Manufacturing Businesses." NBER Working Paper No. 3449. September 1990.

Sample

65 non-union manufacturing companies in the U.S., drawn from the 1986 Columbia Business Unit survey. Companies with more than one business line are represented by their primary business line. This sample includes less than 1% of the original universe of over 7,000 business lines that were surveyed.

Data

Performance: Tobin's *q* (market value / replacement cost of assets), net sales per worker--controlling for the industry average cost of purchased materials are used to approximate the value added. Note that net sales is recorded by business line and not by company, increasing the number of observations to 126.

Work Practices: job design, employee training, promotions system, and employee management communication.

Results

Eight work systems were identified using cluster analysis of the six practices. Work systems predominantly characterized by little job flexibility and no formal training program had significantly lower stock market value and productivity than systems that had flexible job design and formal training.

Comments

The categorization of eight different work systems among the 65 companies resulted in a few companies representing each system.

Human resource systems and productivity for 30 steel finishing lines.

Citation

Ichniowski, Casey, Kathryn Shaw, and Giovanna Prennushi. "The Effects of Human Resource Management Practices on Productivity." Mimeograph, Columbia University, June 10, 1993.

Sample

30 comparable steel finishing lines in the U.S. A large majority of these lines used union workers.

Data

Performance: "uptime"--the fraction of time the line is running as scheduled (with a sample average of 92%); observations were recorded once a month with an average of five years of data per line. Uptime is used as a measure of productivity because steelworkers influence output levels mainly through prevention of delays. Other key production parameters (such as width and gauge of steel, and line speed) are determined by technical specifications of the line and specification of customer orders. Controls were included for line vintage and quality of steel input.

Work Practices: job flexibility, communication, labor relations, teamwork and cooperation, recruitment and selection, incentive pay, knowledge and skill training, and employment security.

Results

The authors used factor analysis to identify four systems of work practices. For example, "System 1" lines utilized problem-solving teams, gain sharing plans, pay for knowledge, formal training in line operations, and other high performance practices. "System 4" lines, in contrast, were characterized by narrowly defined tasks, incentive pay based on quantity and not quality, and little worker-management communication. System 1 lines were much more productive, with 98% uptime versus 88% uptime for System 4 lines. Lines which adopted more progressive work systems over time also experienced significant increases in productivity. Although the specific work practices were individually correlated with higher productivity when examined in isolation, introduction of any single practice without a change in the overall system had no significant effect on productivity.

Comments

This study examined a broad array of work practices, and used closely comparable measures of productivity. The evidence was corroborated by field interviews from each of the finishing lines in the sample.

Productivity for 112 gain sharing plans in manufacturing.

Citation

Kaufman, Roger. "The Effects of IMPROSHARE on Productivity." *Industrial and Labor Relations Review* 45:2. January 1992. pp. 311-322.

Sample

112 responses from a survey of companies known to have implemented IMPROSHARE--with a response rate of 44%.

Data

Performance: relative number of labor hours used to produce output in comparison to a base period for that firm.

Work Practices: use of IMPROSHARE, a type of gain sharing in which workers are essentially paid bonuses equal to one-half the increase in productivity.

Results

After IMPROSHARE's introduction, defect and downtime rates each fell by 23% in the first year. In the median firm, the overall increase in productivity was more than 5% in the first three months, and more than 15% by the third year. In comparison, productivity increased by an average of roughly 2% per year in these manufacturing sectors.

Comments

Using average productivity in manufacturing as a comparison group is not the same as observing non-IMPROSHARE firms because productivity differs within manufacturing sectors. Also, average productivity will tend to rise as unproductive firms exit the sector, which would understate the difference between IMPROSHARE and non-IMPROSHARE firms. Firms were not observed before implementation of the plan; these firms may have had high (or low) productivity growth before implementation.

Employee responsibility and participation in 1,000 machining firms.

Citation

Kelley, Maryellen. "Productivity and Information Technology." Working paper 92-2, School of Urban and Public Affairs, Carnegie-Mellon University, January 1992.

Kelley, Maryellen and Bennett Harrison. "Unions, Technology, and Labor-Management Cooperation." in *Unions and Economic Competitiveness*, ed. by Lawrence Mishel and Paula Voos. Washington: Economic Policy Institute, 1992.

Sample

Responses from 1,015 plants in the U.S. metalworking and machinery sectors (covering 25% of all manufacturing employment in 1986-87). The response rate to this survey was 50%.

Data

Performance: machining time per unit of output. All of these plants use machine tools in some aspect of their production process.

Work Practices: percentage of workers who write their own instructions for computer programmable machining, presence of labor-management problem-solving committees.

Results

In the case of computer controlled technology, production time decreased considerably when shopfloor workers wrote their own control programs. These findings suggest that if the percentage of workers who wrote their own programs increased from the current level of 45% to a level of 75%, then total production time would decrease about 9% (Kelley 1992). The presence of collaborative problem-solving committees in unionized plants was found to have an ambiguous association with productivity in machining. In non-union plants, problem-solving committees appear to be associated with lower productivity than in plants without committees (Kelley and Harrison 1992).

Comments

Kelly (1992) also found that having more work rules cut machining time. In a single cross-section of data, Kelly and Harrison (1992) observed the existence of a committee in the plant, not the number of committees, their level of responsibility, or any other measure of the extent of collaboration.

Financial performance of 150 large firms with "progressive" human resource systems.

Citation

Kravetz, Dennis. *The Human Resources Revolution.* S.F.: Jossey-Bass, 1988.

Sample

Responses from 150 companies from the 1984 *Forbes* 500 "Annual Directory" and selected large banks and financial services companies, with a response rate of 30%.

Data

Performance: Five-year trends in profits, sales, earnings per share, and dividends.

Work Practices: Rating of 51 elements of human resource practice from six main areas: participation and management style, culture, organizational structure, creativity, reward systems, and flexibility and accommodation of needs. Usage was evaluated on a one-to-five scale.

Results

Aggregating the ratings of all 51 human resource elements created an index. The 75 firms scoring highest on this index were grouped together as "progressive" companies; the 75 firms scoring lowest were considered "less progressive" companies. The annual rate of change from 1978-83 is shown for the following performance measures:

Measure	75 Progressive	75 Less Progressive
Profit growth	10.8%	2.6%
Sales growth	17.5%	10.7%
Growth in earnings per share	6.2%	-3.9%
Dividend growth	13.4%	9.2%

Progressive firms performed better. For example, profit growth from 1978 to 1983 was 10.8% per year in progressive firms versus 2.6% per year in less progressive firms.

Comments

These financial performance indicators were not compared to industry averages.

Review of 27 studies on profit sharing and productivity.

Citation

Kruse, Douglas. *Profit Sharing: Does It Make a Difference?* Kalamazoo: Upjohn Institute, forthcoming.

Sample

27 formal econometric studies. Of the 27 studies, 9 examine U.S. firms; five of these have sample sizes of less than 200, while the remaining four have sample sizes that range from 495 to 2,976.

Data

Performance: most studies used a measure of value-added or sales per employee.

Work Practices: presence of a profit sharing plan, profit share per employee or as a percentage of compensation, and/or percent of employees covered by profit sharing.

Results

91% of the coefficients reported in these studies showed that profit sharing was positively related to productivity, and 57% of these coefficients were statistically significant. Profit sharing was associated with 3% to 5% higher productivity; the median differential was 4.4%. Pre/post comparisons showed similar productivity gains for firms that adopted profit sharing.

Comments

The four studies with the largest samples of American firms found that the association between profit sharing and productivity did not diminish after controlling for other personnel policies; i.e. profit sharing effects did not appear to be dependent upon the simultaneous use of other practices.

Review of 29 studies on employee participation in decision-making and productivity.

Citation

Levine, David and Laura D'Andrea Tyson. "Participation, Productivity, and the Firm's Environment." in *Paying for Productivity*, ed. by Alan Blinder. Washington: The Brookings Institution, 1990. pp. 183-235.

Sample

29 studies of conventional firms are reviewed including 8 case studies, 12 field experiments, and 9 econometric tests.

Data

Performance: various quantitative measures of productivity.

Work Practices: various measures of participation (including existence of quality circles, work teams, works councils, and the number of workers participating in such groups).

Results

14 studies concluded that participation had a positive effect on productivity while only two found that it had a negative effect. The other thirteen offered ambiguous results. The authors concluded that "participation usually has a positive, often small, effect on productivity, sometimes a zero or statistically insignificant effect, and almost never a negative effect. ... Participation is more likely to have a positive long-term effect on productivity when it involves decisions related to shopfloor daily life [job redesign, participative work groups], when it involves substantive decision-making rights rather than purely consultative arrangements (for example, quality circles), and when it is characterized by a high degree of employee commitment and employee-management trust" (p. 183-4).

Comments

13 of the 29 studies reviewed examined substantive participation in decision-making on the shopfloor--which the authors concluded was the most important type of participation. Three of these were econometric studies of which two analyzed American firms; one found a positive relationship between participation of American clerical and production workers and productivity, while the other found ambiguous effects for American autoworkers.

Flexible production, productivity, and quality in 62 auto assembly plants.

Citation

MacDuffie, John Paul. "Human Resource Bundles and Manufacturing Performance." Mimeograph, Wharton School, University of Pennsylvania, June 1993.

MacDuffie, John Paul and John Krafcik. "Integrating Technology and Human Resources for High-Performance Manufacturing." in *Transforming Organizations*, ed. by Thomas Kochan and Michael Useem. New York: Oxford University Press, 1992. pp. 210-226.

Sample

62 automobile plants from the MIT International Automotive Assembly Plant Study, which includes twenty-four assemblers in sixteen countries--approximately 60% of assembly capacity worldwide. 18 plants are located in North America.

Data

Performance: labor productivity (hours of production time per vehicle, standardized for vehicle complexity, vertical integration, vehicle size and complexity, and some design features) and quality (defects per 100 units).

Work Practices: a work systems index (work teams, problem-solving groups, suggestions made and implemented, job rotation, decentralization of quality responsibilities to line workers), a human resource policies index (recruitment, contingent compensation, training) and a buffers index (extent of inventories and repair space used to cushion the impact of unforeseen problems).

Results

Three work practice indices were used to identify mass production and flexible production plants--with flexible production having more innovative work systems and human resource policies, and fewer buffers. For vehicles with comparable complexity made in plants with similar technology, mass production took 30 hours for assembly and had .8 defects per vehicle. Both production time and defect rates were substantially lower using flexible production, which took 22 hours to assemble a vehicle with an average of .5 defects (MacDuffie and Krafcik, 1992).

Comments

Most of the flexible production plants in this study were in Japan or were Japanese-owned but located in North America; among these plants, there remained a positive relationship between more flexible practices and both productivity and quality (MacDuffie 1993). These studies did not explicitly control for quality of inputs or designs that facilitate easier "manufacturability."

An analysis of organizational change and performance in 131 field studies

Citation

Macy, Barry and Hiroaki Izumi. "Organizational Change, Design, and Work Innovation: A Meta-analysis of 131 North American Field Studies--1961-1991." in *Research in Organizational Change and Development, Vol. 7, 1993.* ed. by R. Woodman and W. Pasmore. JAI Press, forthcoming.

Sample

131 North American longitudinal field studies published between 1961 and 1991 that examined organizational changes affecting 15 or more employees, chosen from approximately 1,800 field studies.

Data

Performance: 75 studies using various performance measures including productivity, quality, and cost.

Work Practices: 44 practices in three main categories: structural (e.g., job design, teamwork), human resources (training, communication), and technological (computerization, robotics).

Results

Differences in average performance between experimental/control groups and pre/post evaluations of changes from various performance measures used in the field experiments using standardized d-effect scores. Results from 75 studies showed that changes in work practices were strongly related to increased productivity. In a selected sample of the field studies, the introduction of new practices was generally associated with a 30% to 40% improvement in performance. The productivity, quality, and cost outcomes were significantly related to the number of new work practices used.

Comments

This study also finds slight positive effects on behavioral outcomes (absences, turnover, accidents) and no changes in employee attitudes (perceptions about work environment, group and individual characteristics) resulting from organizational design changes.